

## WHAT IS CLAIMED IS:

1. A loadlock comprising:  
a first support structure adapted to support a first substrate; and  
a cooling plate adapted to support a second substrate.
2. A loadlock as in claim 1, wherein said cooling plate is disposed below said first support structure.
3. A loadlock as in claim 1, further comprising a second support structure disposed below said first support structure, said second support structure being moveable relative to said cooling plate.
4. A loadlock as in claim 3, wherein said cooling plate is positioned to accept a processed substrate from said second support structure.
5. A loadlock as in claim 1, wherein said cooling plate includes at least one groove on its surface.
6. A loadlock as in claim 5, wherein said cooling plate further includes at least one coolant carrying channel.
7. A loadlock as in claim 1, wherein said cooling plate includes an anodized surface region.
8. A loadlock as in claim 3, further comprising an elevator to control the vertical position of said first support structure and said second support structure.
9. A loadlock as in claim 8, wherein said second support structure extends through said cooling plate.
10. A loadlock as in claim 8, further comprising an unprocessed substrate on said first support structure and a processed substrate on said second support structure.

1 11. A loadlock as in claim 10, wherein said unprocessed substrate comprises a  
2 glass material.

1 12. A loadlock as in claim 1, further comprising a heating device disposed  
2 above said first support structure.

1 13. A loadlock as in claim 8, further comprising a moveable cassette which  
2 includes said first support structure and second support structure.

1 14. A loadlock as in claim 13, further comprising a loadlock body portion which  
2 defines a first aperture adapted to accept unprocessed substrates into said loadlock and a  
3 second aperture adapted to receive a processed substrate.

1 15. A loadlock as in claim 14, wherein said elevator is adapted to elevate said  
2 cassette, and said cooling plate is coupled to said loadlock body portion.

1 16. A loadlock as in claim 13, wherein said cassette further comprises a first  
2 plate and said first support structure is coupled to said first plate.

1 17. A loadlock as in claim 16, wherein said first plate and said cooling plate  
2 each include a first surface region having a first emissivity and a second surface region  
3 having a second emissivity, said second emissivity being greater than said first emissivity.

1 18. A loadlock as in claim 16, wherein said cassette further comprises a  
2 second plate located below said cooling plate and said second support structure is  
3 coupled to said second plate.

1 19. A loadlock as in claim 18, wherein said cassette further comprises a third  
2 plate located above said first support structure.

1 20. A loadlock as in claim 19, further comprising a heating device located  
2 above said third plate.

1 21. A loadlock as in claim 16, further comprising a filter disposed above said  
2 first support structure.

1 22. A loadlock comprising:  
2 a chamber body;  
3 a first support structure in said chamber body adapted to support one  
4 unprocessed substrate;  
5 a second support structure in said chamber body adapted to support one  
6 processed substrate;  
7 said first support structure being disposed above said second support structure;  
8 an elevator to control the vertical position of said first support structure and said  
9 second support structure;  
10 a first aperture to permit insertion of an unprocessed substrate into said loadlock  
11 and removal of a processed substrate from said loadlock;  
12 a second aperture to permit removal of an unprocessed substrate from said  
13 loadlock and insertion of a processed substrate into said loadlock;  
14 a cooling plate including a surface adapted to support a processed substrate  
15 thereon; and  
16 a heating device located above said first support.

1 23. A loadlock as in claim 22, wherein said second support structure extends  
2 through said cooling plate when positioned to support one processed substrate.

1 24. A loadlock as in claim 22, wherein said first support structure and said  
2 second support structure are movable relative to said cooling plate.

1 25. A loadlock as in claim 24, wherein said cooling plate is attached to said  
2 chamber body.

1 26. A loadlock as in claim 25, wherein said cooling plate has a plurality of holes  
2 therein to permit said second support structure to move therethrough.

1 27. A loadlock as in claim 22, further comprising a middle plate between said  
2 first support structure and said second support structure.

1 ~~7~~ 28. A loadlock as in claim 27, wherein said cooling plate includes at least one  
2 structure extending therefrom and said middle plate includes at least one opening sized to  
3 accommodate said at least one structure extending from said cooling plate.

1 ~~8~~ 29. A loadlock as in claim 27, wherein said first support structure is connected  
2 to said middle plate.

1 ~~9~~ 30. A loadlock as in claim 27, wherein said middle plate includes a cooling  
2 layer and an insulation layer.

1 31. A loadlock as in claim 22, further comprising a heating element disposed  
2 above said first support.

1 ~~10~~ 32. A loadlock as in claim 22, wherein said first support structure comprises a  
2 plurality of pins and said second support structure comprises a plurality of pins.

1 33. A semiconductor processing system comprising:  
2 at least one processing chamber;  
3 a transfer chamber connected to said at least one processing chamber; and  
4 a loadlock connected to said transfer chamber, said loadlock comprising:  
5 a single substrate upper support and a single substrate lower support;  
6 a transfer aperture to transfer a single substrate between said transfer  
7 chamber and said loadlock;  
8 an elevator to raise and lower said single substrate upper support and said  
9 single substrate lower support; and  
10 a cooling plate disposed in said loadlock and positioned to accept a single  
11 substrate from said single substrate lower support.

1 34. A semiconductor processing system as in claim 33, wherein said single  
2 substrate lower support extends through said cooling plate.

1 35. A semiconductor processing system as in claim 33, wherein said loadlock  
2 further comprises a load/unload aperture through which an unprocessed substrate may

3 be loaded into said loadlock and through which a processed substrate may be unloaded  
4 from said loadlock.

1 36. A semiconductor processing system as in claim 35, wherein said loadlock  
2 further comprises a transfer aperture through which an unprocessed substrate may be  
3 delivered from said loadlock to said transfer chamber and through which a processed  
4 substrate may be delivered from said transfer chamber to said loadlock.

1 37. A semiconductor processing system as in claim 35, wherein said loadlock  
2 further comprises a heating element.

1 38. A semiconductor processing system as in claim 36, wherein said loadlock  
2 further comprises a heating element and said heating element is disposed above said  
3 single substrate upper support.

1 39. A semiconductor processing system as in claim 38, wherein said loadlock  
2 further comprises a middle plate disposed above said cooling plate and below said  
3 heating element.

1 40. A semiconductor processing system as in claim 39, wherein said single  
2 substrate upper support is connected to said middle plate.

1 41. A semiconductor processing system as in claim 40, further comprising a  
2 gas inlet to supply a gas to said loadlock.

1 42. A semiconductor processing system as in claim 41, wherein said loadlock  
2 includes a top surface, said gas inlet being located along said top surface of said  
3 loadlock.

1 43. A semiconductor processing system as in claim 35, further comprising at  
2 least one processing chamber coupled to said transfer chamber, said at least one  
3 processing chamber consisting of at least one chamber selected from the group  
4 consisting of a physical vapor deposition chamber, a chemical vapor deposition chamber,  
5 an etching chamber, and a heating chamber.

1 44. A semiconductor processing system as in claim 43, further comprising:  
2 an external substrate supply station comprising:  
3 a first robot to deliver substrates to said loadlock and pick up substrates from said  
4 loadlock;  
5 at least one unprocessed substrate cassette to supply unprocessed substrates to  
6 said loadlock; and  
7 at least one processed substrate cassette to accept processed substrates from  
8 said loadlock.

1 45. A semiconductor processing system as in claim 44, further comprising a  
2 second robot to transfer a substrate between said loadlock and said transfer chamber.

1 46. A semiconductor processing system as in claim 36, further comprising:  
2 a transfer chamber robot to transfer a substrate between said loadlock and said  
3 transfer chamber;  
4 at least one processing chamber coupled to said transfer chamber, said at least  
5 one processing chamber consisting of at least one chamber selected from the group  
6 consisting of a physical vapor deposition chamber, a chemical vapor deposition chamber,  
7 an etching chamber, and a heating chamber.

1 47. A semiconductor processing system as in claim 46, further comprising a  
2 loadlock delivery robot to transfer an unprocessed substrate into said loadlock and  
3 remove a processed substrate from said loadlock.

1 48. A semiconductor processing system as in claim 33, further comprising a  
2 substrate disposed on said cooling plate and a cooling gas comprising helium disposed in  
3 said loadlock.

1 49. A semiconductor processing system as in claim 48, wherein said cooling  
2 gas further comprises nitrogen.

1 50. A loadlock system comprising:  
2 a loadlock chamber;  
3 a support structure disposed in said chamber, said support structure adapted to  
4 accept a single substrate from a robot arm;  
5 a cooling plate disposed in said chamber; said cooling plate positioned to accept a  
6 single substrate from said support structure; and  
7 wherein said support structure is movable relative to said cooling plate.

1 51. A loadlock system as in claim 50, wherein said cooling plate includes at  
2 least one aperture through which said support structure may extend.

1 52. A loadlock system as in claim 50, further comprising a heating device  
2 disposed in said loadlock chamber, said heating device being located above said support  
3 structure and said cooling plate.

1 53. A loadlock system comprising:  
2 first means for supporting only a single unprocessed substrate;  
3 second means for supporting only a single processed substrate;  
4 said first means being located above said second means; and  
5 delivery means for delivering a processed substrate to a cooling plate in said  
6 loadlock system.

1 54. A loadlock system as in claim 53, further comprising cooling means for  
2 cooling said substrate on said cooling plate.

1 55. A loadlock system as in claim 53, further comprising heating means for  
2 heating a substrate, said heating means disposed above said first support.

1 56. A method for using a loadlock comprising:  
2 delivering an unprocessed substrate to an upper support structure in said loadlock  
3 through an opening in said loadlock;  
4 closing said opening and evacuating said loadlock;  
5 transferring said unprocessed substrate to a chamber outside of said loadlock;  
6 delivering a processed substrate from said chamber outside of said loadlock to a

7 lower support structure in said loadlock;  
8 delivering said processed substrate from said lower support structure to a cooling  
9 plate in said loadlock; and  
10 cooling said processed substrate.

1 57. A method as in claim 56, wherein said cooling includes introducing a gas  
2 into said loadlock and filtering said gas as it enters said loadlock.

1 58. A method as in claim 56, wherein said cooling includes introducing a gas  
2 comprising helium into said loadlock.

1 59. A method as in claim 56, wherein said cooling includes introducing a gas  
2 comprising a helium gas and a nitrogen gas into said loadlock.

1 60. A method as in claim 59, wherein said gas includes said nitrogen gas  
2 present at a pressure of about 754 to about 759 torr and said helium gas present at  
3 about 1 to about 6 torr.

1 61. A method as in claim 58, wherein said gas consists essentially of 757 torr  
2 nitrogen and 3 torr helium.

1 62. A method as in claim 56, further comprising heating said unprocessed  
2 substrate in said loadlock prior to transferring said unprocessed substrate to said  
3 chamber outside of said loadlock.

1 63. A method as in claim 56, further comprising heating said unprocessed  
2 substrate in said loadlock prior to transferring said unprocessed substrate to said  
3 chamber outside of said loadlock.

1 64. A method as in claim 56, wherein said cooling said processed substrate  
2 includes providing a cooling fluid to said cooling plate to transfer heat away from said  
3 cooling plate.

1 65. A method as in claim 56, wherein said delivering said processed substrate



2 to said cooling plate comprises lowering at least a portion of said lower support structure  
3 through said cooling plate so that a lower surface of said processed substrate is placed  
4 onto an upper surface of said cooling plate .

1 66. A method as in claim 65, wherein said lowering at least a portion of said  
2 lower support structure through said cooling plate comprises lowering a top of said lower  
3 support structure to a position lower than said upper surface of said cooling plate.

1 67. A method as in claim 56, further comprising positioning a second plate  
2 above said processed substrate at a position so that heat from said processed substrate  
3 is transmitted to said second plate.

1 68. A method as in claim 56, further comprising supplying a cooling fluid to  
2 cool said second plate and said cooling plate.

1 69. A method for processing substrates comprising:  
2 delivering an unprocessed substrate to an upper support structure in a loadlock  
3 through a first opening in said loadlock;  
4 closing said first opening and evacuating said loadlock;  
5 delivering said unprocessed substrate to a chamber outside of said loadlock  
6 through a second opening in said loadlock;  
7 delivering a processed substrate from said chamber outside of said loadlock to  
8 said lower support structure through said second opening in said loadlock; and  
9 delivering said processed substrate to a cooling plate in said loadlock.

1 70. A method as in claim 69, wherein delivering said processed substrate to  
2 said cooling plate comprises lowering said lower support structure relative to said cooling  
3 plate.

1 71. A method as in claim 69, further comprising:  
2 cooling said substrate on said cooling plate;  
3 raising said lower support structure relative to said cooling plate to remove said  
4 processed substrate from said cooling plate; and  
5 removing said processed substrate from said loadlock through said first opening.

1 72. A method as in claim 71, further comprising venting said loadlock prior to  
2 raising said lower support structure to remove said processed substrate from said cooling  
3 plate.

1 73. A method as in claim 72, wherein said venting comprises delivering a  
2 cooling gas to said loadlock.

1 74. A method as in claim 73, wherein said venting gas comprises helium.

1 75. A method as in claim 72, wherein said cooling said substrate on said  
2 cooling plate, venting said loadlock, removing said processed substrate from said cooling  
3 plate, and removing said processed substrate from said loadlock through said first  
4 opening is carried out in a time of no greater than 60 seconds.

1 76. A method as in claim 72, further comprising heating said processed  
2 substrate in said loadlock prior to venting said loadlock.

1 77. A method as in claim 75, wherein said time is no greater than 30 seconds.

1 78. A method as in claim 77, wherein said unprocessed substrate is preheated  
2 in said loadlock prior to delivering said unprocessed substrate to a chamber outside of  
3 said loadlock, and said preheating is carried out in a time of no greater than 60 seconds.

1 79. A method as in claim 78, wherein said preheating is carried out in a time of  
2 no greater than 30 seconds.

1 80. A method as in claim 71, further comprising:  
2 lowering said lower support structure relative to said first opening after removing  
3 said processed substrate from said loadlock through said first opening; and  
4 aligning said upper support structure to accept an unprocessed substrate on upper  
5 support structure through said first opening.

1 81. A method as in claim 69, further comprising heating said unprocessed  
2 substrat in said loadlock.

1 82. A method as in claim 81, wherein said heating is carried out in a time of no  
2 greater than 60 seconds.

1 83. A method as in claim 81, wherein said heating is carried out for no greater  
2 than 30 seconds.

1 84. A method as in claim 71, wherein said cooling said substrate on said  
2 cooling plate includes positioning a second late above said substrate, said second plate  
3 positioned so that heat from said substrate is transferred to said second plate.

1 85. A method as in claim 84, wherein said second plate is positioned  
2 approximately 5 mm from said substrate.

1 86. A method as in claim 84, further comprising positioning at least one pin  
2 extending from said cooling plate to said middle plate.

1 87. A method as in claim 69, wherein said delivering said processed substrate  
2 from said chamber outside of said loadlock to said lower support structure is carried out  
3 prior to delivering said unprocessed substrate to said chamber outside of said loadlock.

1 88. A method as in claim 87, further comprising heating said unprocessed  
2 substrate in said loadlock prior to delivering said unprocessed substrate to a chamber  
3 outside of said loadlock.

1 89. A method as in claim 69, wherein said delivering said unprocessed  
2 substrate is carried out after said delivering said processed substrate.

1 90. A method for processing a substrate comprising:  
2 delivering one unprocessed substrate from an unprocessed substrate supply to a  
3 first loadlock support structure using a first robot;  
4 transferring said unprocessed substrate from said loadlock to a transfer chamber

5 using a second robot;

6 transferring said unprocessed substrat from said transfer chamb r to at least one  
7 processing chamber to process said unprocess d substrate to form a processed  
8 substrat ;

9 transferring said processed substrate from said at least one processing chamber  
10 to said transfer chamber;

11 transferring said processed substrate from said transfer chamber to a second  
12 loadlock support structure in said loadlock using said second robot;

13 transferring said processed substrate from said second loadlock support structure  
14 to a cooling plate in said loadlock;

15 cooling said processed substrate; and

16 removing said processed substrate from said loadlock using said first robot.

1 91. A method as in claim 90, further comprising heating said unprocessed  
2 substrate in said loadlock prior to transferring said unprocessed substrate from said  
3 loadlock to said transfer chamber.

1 92. A method as in claim 90, further comprising positioning a heater in said  
2 loadlock above said first loadlock support structure.

1 93. A method as in claim 90, wherein said cooling said processed substrate  
2 includes venting said loadlock prior to removing said processed substrate from said  
3 loadlock, said venting including introducing a gas comprising helium into said loadlock.

1 94. A method as in claim 90, further comprising positioning said first support  
2 structure above said second support structure in said loadlock.

1 95. A method for processing substrates comprising:  
2 delivering a single unprocessed substrate to an upper support structure in said  
3 loadlock,  
4 evacuating said loadlock;  
5 delivering said single unprocessed substrate from said loadlock to said transfer  
6 chamber;  
7 delivering a single processed substrat from a transfer chamber to a lower support

8 structure in said loadlock;

9 delivering said single processed substrate from said lower support structure to a  
10 cooling plate in said loadlock;

11 v nting said loadlock;

12 delivering said single processed substrate to a location external to said loadlock  
13 and said transfer chamber; and

14 delivering another single unprocessed substrate to said loadlock.

1 96. A method as in claim 95, further comprising heating said single  
2 unprocessed substrate in said loadlock prior to delivering said single unprocessed  
3 substrate to said transfer chamber. A

1 97. A method as in claim 95, wherein said delivering said single processed  
2 substrate from said lower support structure to said cooling plate comprises lowering said  
3 lower support structure through said cooling plate and placing a lower surface of said  
4 single processed substrate onto an upper surface of said cooling plate.

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